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JAPANESE LAC.—(KI-URUSHI).

By A. B. Stevens.

Doubtless nearly every one has seen and admired the beautiful Japanese vases or boxes without realizing that they were finished with the most indestructible varnish known to man. There are at present vases, more than a century old, that have retained their beautiful luster so perfectly that they look as though they had been finished but yesterday. The hardened surface formed by the genuine Japanese Lac is practically unaffected by the usual reagents, which are so detrimental to most varnished surfaces, as alcohol, ether, alkalies and acids. It is acted upon to some extent by strong sulphuric or nitric acid, and may be dissolved by continued heating in fuming nitric acid.

Rein[1] states that the Japanese doubtless received their knowledge of the lac industry from the Chinese in the early part of the third century. But that its use did not attain great importance before the middle of the seventh century. Kôtoku-Tennô, the thirty-sixth Mikado (645 to 654 A.D.), had a ceremonial head-covering of paper, which was covered with black lacquer. There is a lacquered scarf box in the temple at Nara, which belonged to a priest in the time of Kinnari Tennô (540 to 572 A.D).

For centuries its use and production remained a secret. As late as 1873 we find the statement that "The manner of preparing the varnish and the mode of applying it is likely to remain a secret."[2]

[1] J. J. Rein's "The Industries of Japan," London, 1886; Rein, "Japan II," Leipzig, 1886. This author has minutely described the lac industry, and it is to this excellent work that I shall frequently refer.

[2] Belfour's Cyclopædia of India.

In the following year Prof. J. J. Rein made a thorough study of the method of collecting and applying the lac.

The pure lac is a natural product of *Rhus vernicifera*, a small tree about 15 feet high, growing wild in China and Japan, where it is also cultivated in many parts of the country. The largest yield is from trees about fifteen years old, but the age of the tree when the lac is collected varies in different localities, in some places at from five to six years when the stem is the size of a man's arm, and in other localities at from nine to ten years old. The time of collecting is from April to the 1st of November.

The lac is obtained by making horizontal incisions in the bark with a hook-shaped instrument and alternating from side to side of the tree. The sap is removed from the incisions with a pointed spatula. These operations are repeated at intervals of about four days until the tree is literally covered with grooves. The lac is in the form of a grayish-white emulsion, which, on exposure to air, changes to brown and finally to black. The raw lac is strained to remove pieces of bark, and then mixed until uniform, when it is ready for use, and is known as "Ki-Urushi." A second grade known as "Seshime-Urushi" is obtained at the close of the season by cutting and binding the branches into bundles and macerating these with the trunk in warm water, when more of the sap exudes and is removed from the surface of the water.

The beautiful black color is produced by "Laccasse," a soluble oxidizing enzyme, acting on the resins in the presence of moisture. The best results are obtained by allowing the lac to harden in a moist atmosphere. Therefore, the articles coated with the lac are placed in a room and wet clothes hung on the walls or about the lacquered articles. A temperature of from 20° to 30° is best for the action of the enzyme. If the lac is allowed to harden in a dry atmosphere it has a dull appearance, varying in shade from brown to black.

The most important chemical investigations of this lac were made by two Japanese chemists.[1] Yoshida reports that the lac consisted of a non-volatile resinous acid, which he calls urushic acid, a volatile poison, gum, identical with gum arabic, diastatic matter and water.

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[1] H. Yoshida, *Jour. Chem. Soc.*, 1883, p. 472. O. Korschelt and H. Yoshida, *Transact. As. Soc.*, Japan, XII, p. 182.

I have found that his urushic acid consisted of at least four substances, one of which is the poisonous principle and is non-volatile. Also that the gum and diastatic matter are inseparable. The volatile portion, obtained by passing steam through the lac, consisted of acetic acid and a small quantity of the resinous acid, which was evidently carried over with the steam, but on removal from the distillate by shaking with ether and then evaporating was not volatile or poisonous. The distillate also contained acetic acid.

The resinous substances were removed from the other constituents by dissolving in alcohol and recovering the alcohol by distillation.

Separation by Lead Acetate.—Lead acetate was added to a portion of the alcoholic residue as long as a precipitate was formed. The precipitate, which was of a light-gray color, was washed with alcohol, mixed with fresh alcohol, decomposed with sulphuric acid, and the excess of acid removed with lead carbonate. On evaporating the alcohol a brown oily residue was obtained, which was somewhat darker than the original alcoholic residue, but otherwise similar.

To the filtrate from the lead acetate precipitate, solution of lead subacetate was added as long as a precipitate was formed. The precipitate was of a gray color, but lighter than that obtained by lead acetate. On decomposing the precipitate as above, an oily residue was obtained, which was also lighter than that obtained from lead acetate.

The filtrate from the subacetate precipitate was still of a brownish color. The excess of lead was removed by sulphuric acid, and the excess of acid removed by lead carbonate and filtering. The filtrate was readily precipitated by lead acetate or subacetate. By repeated experiments with the original alcoholic solution it was found that by precipitation with lead acetate and removing the lead and acid from the filtrate, adding more lead acetate, and repeating this operation until all of the resinous substance was precipitated, and finally decomposing the separate precipitates, that a series of oily residues could be obtained, gradually diminishing in quantity and increasing in fluidity, and becoming a shade lighter in color than the preceding. Lead subacetate is a better precipitant than lead acetate. The acetic acid liberated evidently aids in preventing complete precipitation. The fact that the fractions decrease in color and viscosity, and that only the last fractions were poisonous, indicates that the

alcoholic extract consisted of a mixture of two or more substances. But in no case can the above method be considered as a complete separation. Alcoholic solutions of each of the fractions assumed a green or greenish-black color with alkalies, the color varying with the concentration of the solution and the strength of the alkali.

By shaking an ether solution of resinous substances with a 1 per cent. solution of sodium carbonate a solution was obtained which deposited a reddish-brown precipitate on the addition of an acid. This precipitate was insoluble in all ordinary solvents, including acids and alkalies, except fuming nitric acid. This is doubtless the same substance which Yoshida obtained and named "Oxyurushic acid," but as it does not possess any of the properties of an acid Professor Tschirch suggested the name "Oxyurushin," which I have adopted. All of the resinous substances may be converted into oxyurushin by heating with a sufficient quantity of fixed alkali, when it will be precipitated as a black insoluble compound, changing to reddish brown on the addition of acids.

Separation into Benzin-soluble and Benzin-insoluble.—At first it appeared as though the alcoholic residue was soluble in all of the ordinary solvents for oils and resins, but investigation proved that it was not completely soluble in all proportions of carbon disulphide, methyl alcohol, amyl alcohol or petroleum benzin. After numerous experiments the following method was adopted: One part of the resinous substance was dissolved in 7 parts of benzin, forming a clear solution, but further addition of benzin caused a precipitate. This was then poured into 55 parts of benzin, which caused an immediate separation of a thick, brown mass, leaving a cloudy liquid. After twelve hours the benzin became clear and was not affected by the further addition of benzin. The benzin was decanted and the precipitate dissolved in a small quantity of benzin and again precipitated by pouring into a larger amount. This operation was repeated several times until the precipitate became entirely insoluble in benzin. By this method the resinous substances were separated into a benzin-soluble and a benzin-insoluble.

Separation of the Benzin-insoluble into Methyl Alcohol-soluble and Methyl Alcohol-insoluble.—By treating the benzin-insoluble portion with methyl alcohol it could be separated into two substances, one soluble and the other insoluble in methyl alcohol. Only about half of the insoluble portion was soluble in ether, the remainder appar-

ently having undergone oxidation into oxyurushin during manipulation with methyl alcohol and evaporation. This theory is supported by the fact that the methyl alcohol solution becomes cloudy on standing. A similar change doubtless takes place in ethyl alcoholic solutions, though much more slowly, as a slight deposit was noticed when an alcoholic solution was allowed to stand for some time.

Separation of the Benzin-soluble into two or more substances.—The benzin solution was evaporated and 1 volume of the oily residue dissolved in 8 volumes of benzin and 4 volumes of alcohol added and the whole thoroughly agitated. Upon standing it separated into two layers. The upper benzin layer was of a yellowish-brown color, the lower alcohol layer reddish brown. These were separated and the benzin solution washed with alcohol as long as the washings were colored. The benzin was evaporated, leaving an oily, non-poisonous, brown residue. The alcoholic solution was evaporated, leaving a slightly gelatinous residue, and by rapidly washing this with benzin a small quantity of oily residue was separated from the gelatinous mass. Both were poisonous. Further washing with benzin dissolved the gelatinous portion. I believe that the alcoholic portion consists of a poisonous and a non-poisonous substance, but thus far have not been able to make a complete separation. I hope to do this later.

All of the above substances in alcoholic solutions were precipitated by lead acetate, subacetate, silver nitrate, mercurous nitrate, cupric acetate and ferric chloride. The lead precipitates were of a light-gray color, gradually becoming darker on standing. All the other precipitates were black.

The resins insoluble in benzin, on exposure to the air in thin layers, slowly changed to oxyurushin. Numerous combustions were made of these and also of the oxyurushin formed by the action of alkali. The oxidation products seem to be the same in all cases. The mean of the results of combustion is as follows:

Found.	Calculated for $C_{102}H_{138}N_2O_{19}$.
72·137	72·206
8·158	8·202
1·652	1·656
18·053	17·936

The Gum-enzyme.—After extracting the lac with alcohol the residue was extracted with cold water and the gum-enzyme precipitated

by pouring into strong alcohol. The precipitate was dissolved in a small quantity of water and reprecipitated with alcohol. By repeating the operation several times and finally washing with ether and drying in an exsiccator, it was obtained perfectly white and easily reduced to powder. In physical appearance it is similar to powdered acacia. When so prepared the gum-enzyme is very active, rapidly changing fresh tincture of guaiac to a deep blue. If an emulsion is made of the gum enzyme and the separated resins, it soon changes to black, but if a solution of the gum-enzyme is heated before mixing with the resins, no change takes place.

Tests for Nitrogen.[1]—The gum-enzyme was tested for nitrogen by the Lassaigne test, which consists in heating the substance with metallic potassium and converting the cyanide so formed into Prussian blue. This test and various modifications of it failed to detect the presence of nitrogen.

When the gum-enzyme is heated in a tube with soda-lime or potassium hydroxide the vapors rapidly change red litmus to blue, but no odor of ammonia could be detected. Professor Tschirch thought the odor similar to pyrrol. By using larger quantities and condensing the vapors, the distillate gave all of the tests for pyrrol.

Another evidence of the presence of nitrogen was obtained as follows: An ordinary open combustion tube was filled with copper oxide and ignited in a current of oxygen. After partially cooling a platinum boat containing the gum-enzyme was introduced, and burned in a current of oxygen. The products of combustion were conducted into a potash bulb containing a solution of potassium hydroxide, prepared from metallic potassium, and water distilled with potassium permanganate. Just before the combustion the solution was tested and found to be free from nitrogen compounds. After the combustion the solution gave with diphenylamine the blue color characteristic of nitrates; with brucine and sulphuric acid a red color and with sulphuric acid and sulphate of iron the brown ring test.

Separation of Gum from the Enzyme.—H. Yoshida states that after removal of the resins by alcohol and extracting the residue with cold water, and then boiling the solution, he obtained a white

[1] For a detailed report of nitrogen in gums, see AM. JOUR. PHARM., 77, p. 255, 1905, also *Pharm. Centralhalle*, 1905, p. 501.

precipitate, and assumes that it is the enzyme that has been removed; but such cannot be the case, as a solution of the pure gum, which is very active, does not give any precipitate on boiling. The precipitate may have been some vegetable albumen which was present in the lac, but I have been unable to find it after repeated trials. All attempts to free the gum from nitrogen have been without success.

Oxidation Products of Gum-enzyme.—Mucic acid is the principal product obtained by oxidizing the gum-enzyme with nitric acid 1·150 sp. gr. Oxalic acid and tartaric acids were also formed.

Hydrolysis of Gum-enzyme.—The gum-enzyme was heated for eight hours with 2 per cent. sulphuric acid, and the acid removed with barium hydroxide and carbonate. The solution was evaporated under diminished pressure, when it formed a light yellow syrup, noncrystallizable, nonfermentable, reduced Fehling's solution and was dextrorotary.

One part of the syrup was heated one hour with 2 parts of phenylhydrazine, 3 parts of sodium acetate, and 20 parts of water. On cooling, an abundant yellow crystalline deposit formed. This was several times recrystallized from hot alcohol when the melting point remained constant, beginning at 162° C. and was complete at 164° C. without the liberation of gas. The crystals were in small spheroidal clusters, which under the microscope appeared to consist of aggregations of needles. This corresponds exactly with the description and melting point given for phenylsorbinazone.[1] A second crop of crystals was obtained by concentrating the mother liquor. These were somewhat darker than the first, and had a melting point of 157° C., but with the production of gas. This corresponds with the description given for inactive sorbinazone.

Bertrand,[2] when working with soluble oxiding ferments, used the gum-enzyme from Japanese lac under the name "Laccasse." He reports that it contained 0·44 per cent. of nitrogen, which he determined by heating with soda-lime and estimating the ammonia formed by titrating with decinormal sulphuric acid. From this he calculated the amount of enzyme present by assuming that it has the elementary composition of albumenous substances. He then gives the composition of the gum-enzyme as:

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[1] Vaubel, Quantitative Bestimmung. Organ. Verbindungen, II Band, 3, 304.

[2] *Bull. Soc. Chem.*, third series, 51, p. 259, 1891.

Water	74·	per cent.
Gum	84·95	"
Laccasse	2·50	"
Ash	5·17	"

From the preceding work it seems to me that I am justified in saying that what he estimated as ammonia was not ammonia but pyrrol.

The Poisonous Principle and its Action.—Prof. J. J. Rein describes the lac poisoning as follows:[1] "It is a peculiar, not very painful, and not at all fatal, but always a disagreeable disease, always attacking any one new to the work. It appears in a mild reddening and swelling of the back of the hands, the eyelids, ears, the navel and lower part of the body, especially the scrotum. In all these parts great heat is felt and violent itching and burning, causing many sleepless nights. In two or three days the crisis is reached, and the swelling immediately subsides. In severe cases small festering boils form also. This lacquer disease is not only caused by handling of the lac, but by its evaporation chiefly, especially that of the sharp Se-shime, to which I owe my own illness. . . . The poison, however, is a volatile substance, and has nothing to do with the lac acid in its higher oxidation, as Korschelt believed. If the poisonous property disappears in the drying of the plant, this amounts to nothing save that the volatile poison fully escapes in this manner. A considerable part of it is driven off in the preparation of the several kinds of lacquer, and by stirring in open vessels. For this reason, the lacquers mixed with colors are regarded far less dangerous than the raw lac and its derivatives. When such lac has been for a long time shut up in a closed box or tub, the experienced workman turns away his face when the vessel is opened that he may not inhale the accumulated vapors."

Yoshida also states that the lac contains a volatile poison which is dissolved with the urushic acid by alcohol, but is almost completely driven off by drying the acid at 105° C. to 110° C. Bertrand[2] says that the lac must be handled with the greatest precaution, because the least traces in the state of vapor produce on the face, hands and arms an intense rubefaction, accompanied by in-

[1] "The Industries of Japan," p. 349.

[2] *Annal. de Chem. et de Phys.*, Series XII, 1897.

tense itching, and adds that these malicious properties make the study of the lac very tedious, and he was obliged to interrupt the studies on account of individual sensibilities.

With these statements before me, it was not without misgivings that I undertook the study of the lac, and these were not allayed by my first experience. The first sample received was in a glass can with metal top which had become sealed by the lac, and was difficult to remove, but when finally started was accompanied by a slight sound of escaping gas. In about thirty-six hours an inflamed spot, about 2 centimeters by 5 centimeters, appeared on my wrist; it itched intensely for about a week and then disappeared. Laboring under the supposition that I was dealing with a volatile poison, I was extremely cautious not to come in contact with the vapors in any form, but supposed that I was practically safe after the alcohol had been distilled and the residue heated for some time. While shaking out an ether solution of the alcoholic residue with sodium carbonate solution, it was difficult to keep the hands entirely free from the solution, and no especial pains were taken to remove it except to carefully wash with soap and water. However, after working some time with it, my face began to swell and continued until my eyes were nearly closed. It extended over hands, arms and lower limbs to the knees; the desire to scratch was very great, so that it was almost impossible to sleep. This was also true of the face and ears to some extent, but here the sensation was more that of burning. After about a week the face became normal, and I was able to resume my work, but the limbs continued to itch and remained covered with a fine rash. After several weeks I became convinced that the underwear had absorbed some of the poison, and though frequently washed still retained it; or that they acted as an irritant to the inflamed surfaces. Soft gauze underwear was then worn next the skin, when the flesh soon became normal.

Dr. Jadassohn, Professor of Skin Diseases in the University of Bern, stated that the above symptoms did not prove that the poisonous principle was volatile, and kindly volunteered to make the physiological tests for me in order to determine whether the poisonous principle is volatile or not. He found that the rabbit was very sensitive to the poison. The method of testing was to rub a small quantity of the substance on the inside of the ear for two or three minutes. If poisonous, inflammation appeared in from one to five

days and the surface soon became covered with watery blisters, followed in severe cases by necrosis of the superficial layers of the skin. This condition lasted about fourteen days, when it gradually disappeared.

Sterilized lac prepared by suspending a tube of the lac in boiling water for half an hour was poisonous. An alcoholic solution of the lac was distilled and the distillate tested, but was not poisonous. After the alcohol was removed the distillation continued, when a small quantity of aqueous distillate was obtained, but this was also inactive. The residue in the retort was extremely poisonous. A fresh can of lac was thorougly cooled to prevent the escape of gas while opening, two small openings were made, and tubes introduced. A small quantity of absorbent cotton was placed in the tube used for the exit of vapor to prevent particles of the fluid from being forced through. The vapor was then slowly forced out of the can upon the ear of a rabbit. Part of the ear was previously moistened. The vapor was entirely without action. Since then I have worked over the lac while evaporating it under all conditions without the slightest inconvenience. The alcoholic residue was later separated into two parts; one soluble and the other insoluble in benzin. The first was poisonous and the second non-poisonous. A thin layer of the first was left in an open crystallizing jar for four months, when it was found to be still poisonous. Another sample of 5 grammes was left in an open vial on a laboratory shelf for ten months, including the hot summer months. This was then tested on my arm, and was found to be still active. These facts are sufficient to prove that the poisonous principle is non-volatile. Doubtless the cases of poisoning that have occurred from opening retainers have been due to minute particles of the lac being forced out with the vapor.

The poison is extremely active even in minute quantities, and as it forms a part of the resinous body, it is very difficult to remove from the skin or clothing. Washing with soap and water is not sufficient to insure its removal. If the hands after contact with the lac are thoroughly washed with soap and water until they are to all appearances clean, and then wet with a solution of caustic alkali, black spots will appear wherever the lac has been in contact. A mixture of powdered soap, pumice stone and carbonate of soda gives the best result. However, to insure safety, I have usually followed this with soap and sand. The poison seems to have little or

no effect upon the thick inner skin of the hand, but to prevent its transmission to other parts it should be removed as soon as possible. For example, by accident some of the benzin solution was thrown into one eye and over one hand. The eye was thoroughly washed with benzin and alcohol, but, in my anxiety for the eye, the hand was forgotten for twenty or thirty minutes, when it was thoroughly washed with benzin and alcohol, followed by soap and sand. The eye escaped without further inconvenience than that caused by the benzin, but in thirty-six hours the surface of the hand became slightly swollen, itched considerably for a week, and then appeared to be covered with a thin, dry scale, which finally disappeared. Since then I have tested different parts of the substance to determine whether or not they were all poisonous, by cutting a hole 6 m.m. in diameter in a piece of gum paper, pasting this on the arm and applying the substance to the opening. In from thirty minutes to one hour the paper was removed and the spot washed with ether or benzin. When the substance was poisonous, the spot became red and began to itch within thirty hours. From three to five vesicles usually appeared. The itching was not intense, usually lasting only a few minutes at a time. A dry scale formed over the surface and remained for several weeks after all irritation ceased.

The poison has not at the present time been isolated in a pure condition.

Dr. Jadassohn and his assistants, Drs. Winkler and Schulz, made twenty-six tests with parts of the lac obtained under different conditions.

Only that portion which is completely soluble in benzin is poisonous and this we have previously seen has been separated by shaking out the benzin solution with alcohol, into two parts, one soluble in alcohol and poisonous, the other insoluble in alcohol but soluble in benzin and non-poisonous. I have elsewhere stated that by fractional precipitation with lead acetate a partial separation of the poison was obtained, but that I did not consider it a practical method.

After the above experiments with the poison were made I received from Dr. F. Pfaff a reprint of his article "On the Active Principle of Rhus Toxicodendron and Rhus venenata."[1] As the

[1] *The Journal of Experimental Medicine*, Vol. II, No. 2, p. 181, 1897.

poisonous action of these plants is practically identical with that of the Rhus vernicifera, his work is of special interest in this connection. He has conclusively proven that the poisonous principle of poison ivy is non-volatile, thus shattering the false idea that has existed for so many years. He claims to have separated the poisonous principle in a pure form by fractional precipitation with lead acetate as an oil. Dr. Pfaff gives the composition of his lead compound as $C_{21}H_{30}O_4P_7$ and proposes the name " Toxicodendrol " as the name of the poisonous principle. The poisonous principle of Japanese lac is so intimately associated with the resin of the lac that I have not considered the method of fractional precipitation to be a complete separation. Preceding investigation indicates that the poisonous principles of these plants are identical, but further investigation is necessary before this can be accepted as conclusive. I hope during the coming year to separate the poison from both these plants and determine their relation. Also to separate the poison from Japanese lac in a pure condition.

The present researches in Japanese lac were undertaken in the Laboratory of the Pharmaceutical Institute of Bern under the guidance of my most highly esteemed director, Prof. Dr. A. Tschirch. To him and also to Prof. Dr. Oesterle I desire to express my warmest and sincerest thanks for the inspiration and the friendly interest and advice which has ever been so freely and so kindly given.

The lac for this investigation was kindly presented by forester Shirasawa, of Tokyo, Japan, and the Rhus Company, Frankfort, Germany. To them I extend sincere thanks.

ANN ARBOR, MICH.

NASCENT SILVER IODIDE.

BY M. I. WILBERT,
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Something more than a year ago one of the physicians connected with the out-patient department of the German Hospital, Philadelphia, requested the assistant apothecary, Mr. John K. Thum, to compound a prescription composed of 5 grammes of a proprietary silver salt and 1 gramme each of iodine and potassium iodide, with a sufficient quantity of water to make 100 c.c. This mixture was

intended to be used as an injection into the urethra, and the direct object that was sought to be attained was to increase the activity of the silver salt and at the same time to eliminate the very objectionable tendency to stain, that is so evidently inherent to all of the soluble salts of silver. The assistant apothecary duly called the physician's attention to the fact that the resulting mixture would necessarily contain something quite different from what he had probably intended, and that in place of using an organic combination of silver he would really be using a nascent or freshly prepared silver iodide that could be produced much more economically by means of silver nitrate in place of the inordinately expensive organic salt of silver. To demonstrate the accuracy of this statement, a corresponding mixture was made by using silver nitrate as the source of the silver iodide.

This nascent silver iodide mixture, prepared from silver nitrate, was subsequently used in a number of cases, and was found to be in all respects the equal, and in some particulars very much superior, to the mixture prepared from the proprietary silver salt. The resulting preparation, made in the form of an emulsion, has been used quite freely, not alone at the German Hospital but also in other institutions, and a preliminary note on "The Use of Iodide of Silver in Urethritis," by Drs. Siter and Uhle, was published in the University of Pennsylvania *Medical Bulletin* for May, 1905.

It may be added here that the use of silver iodide for other purposes than that of a local antiseptic in urethritis, is not by any means of recent origin. Silver iodide was made official in the U.S.P. for 1880, and, for a period at least, was extensively used for internal administration, under the false supposition that, being itself insoluble, it would not produce argyria.

The popularity of silver iodide as an internal remedy was evanescent, however, and the preparation itself was omitted from the recent eighth decennial revision of the Pharmacopœia.

From its widespread use in photography, it has been known for a long time that silver iodide exists in several allotropic forms, and, further, that these allotropic forms or varying physical conditions of the substance play a very important part in its chemical activity when brought in contact with other materials. It has also been known for a long time that although silver iodide is insoluble in water, it is readily decomposed by reducing agents into its constitu-

ent elements, which are known to be active and highly efficient antiseptics.

Bearing in mind, then, these several well-known facts relating to silver iodide, the rationale of the use of this salt for local application as an antiseptic is quite evident. Being itself insoluble, it is not caustic or irritating, while the fact that it is readily decomposed in the presence of reducing agents into active antiseptic materials, would readily suggest its use for this purpose as being practically ideal.

That the activity of the silver iodide varies with age, the exposure to which it has been subjected, and also, in a measure at least, to the relative fineness of the precipitate, are facts also well known to photographers, and may readily be demonstrated by using as a test reagent either a solution of one of the well-known reducing agents used for developing photographic negatives, or a specimen of alkaline urine.

With a finely divided precipitate that has not been unduly exposed, the reduction takes place very rapidly, while an old, or a comparatively coarse, silver iodide may require several minutes before distinct evidences of decomposition manifest themselves. This reduction test, it may be added, should and does offer a readily available method for determining the activity, and therefore the desirability of any given sample of silver iodide.

The most available form for using nascent silver iodide is that of a mixture or an emulsion, being practically a simple suspension of the freshly precipitated silver iodide in a viscid liquid. This vehicle, or suspending medium, may be varied to suit individual need or preference, any one of the bland, inactive, mucilaginous substances, such as Irish moss, quince seed, salep or tragacanth, being readily available.

A mixture containing approximately 3 per cent. of silver iodide has been found to be generally most satisfactory. In preparing such a mixture it should always be borne in mind that the resulting silver iodide is nearly 40 per cent. heavier than silver nitrate, and that therefore a corresponding smaller quantity of the latter salt should be used.

To be most efficient the mixture should be freshly prepared, and should be kept in a cool, dark place. As noted before, the degree of fineness of the resulting precipitate also plays a very important

part in the probable activity of the completed mixture, so that by varying the nature of the resulting precipitate the activity of the mixture itself may be regulated, within a rather wide range, without varying the amount of the contained active ingredient.

The following formula for a mixture containing approximately 3 per cent. of silver iodide has been in use at the German Hospital for some time, and may be considered as a type-formula that may readily be varied to suit the needs or the whim of the prescriber or the ability and the resources of the dispenser.

℞ Silver nitrate . . . . . 2·2 gm.
Potassium iodide . . . . . 2·2 "
Distilled water . . . . . 50 c.c.
Mucilage of Irish moss, N. F., to make . . . . . 100 "
To be mixed according to directions.

For a heavy, coarse precipitate the potassium iodide and the silver nitrate are dissolved separately, each in 5 c.c. of distilled water. The two solutions are subsequently mixed and the mixture, after being thoroughly well shaken, is diluted with the requisite amount of distilled water and mucilage to make 100 c.c.

For a light flocculent precipitate the soluble salts are separately dissolved, each in 50 c.c. of distilled water. The solutions are then mixed, and, after being thoroughly well shaken, the resulting mixture is allowed to stand for a sufficient length of time for the precipitate to subside, so as to allow of decanting 50 c.c. of the supernatant liquid, which is replaced by the required mucilage. It will be noted that no provisions are made for washing the precipitates. In mixtures up to and including the equivalent of 5 per cent. of silver iodide it has been found that the accompanying potassium iodide and potassium nitrate do no material harm and are, if anything, an advantage in that they facilitate osmosis. When mixtures of a higher percentage content of silver iodide are to be used, the accompanying soluble salts may prove to be in excess and should be removed by decantation, preferably in a dark room.

The peculiar properties of silver iodide, to disintegrate when brought in contact with reducing agents, would appear to suggest its use for a number of other purposes, either in mixtures or as a dry powder.

Where silver iodide is to be used locally as a dusting powder, the precipitate should be washed with distilled water, to free it from the

contaminating potassium iodide and potassium nitrate, and then carefully dried in a dark place.

In conclusion, it may be pointed out that silver iodide appears to offer a very wide field for experimentation both for the pharmacist as well as for the physician. The varied activity due to age and physical condition, and the readiness with which a fresh and comparatively active preparation may be prepared extemporaneously would appear to offer little or no excuse for the pharmacist not preparing the preparation himself and explaining its virtues to the physician or the surgeon.

For the latter, on the other hand, silver iodide would appear to offer possibilities for application and use as well as opportunities for research and observation that appear to be well nigh inexhaustible.

LONDON BOTANIC GARDENS.

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A Contribution from the Wellcome Research Laboratories, London.

(*Continued from p. 9.*)

THE MUSEUMS, LABORATORY, AND HERBARIUM.

Although a detailed description of the above does not fall within the limits of this paper, no account of Kew would be complete without some reference to these essential adjuncts of the gardens, and a rapid enumeration of the salient facts connected with them will accordingly be given.

The idea of forming a museum for the reception of drugs and other economic products derived from the vegetable kingdom, originated with Sir William Hooker, who, in 1847, adapted a brick structure which had previously formed part of the Royal Kitchen Gardens, and converted it into a museum. This, together with a small west wing added in 1881, constitutes the present Museum II (see Plate X); it is now devoted to vegetable products derived from monocotyledons and cryptogams.

Museum I (see Plates VIII and X) was opened to the public in 1857. It contains the dicotyledonous and gymnospermous collections, which were removed to it in that year. The extension on the north side was added in 1881 from a grant made by the India office.

Herbarium and Library, Kew Gardens.
The older portion in the foreground is the Library.

HERBARIUM AND LIBRARY, KEW GARDENS.
The older portion in the foreground is the Library.

Museum III (see Plates V and X) is devoted to Timbers. The building was erected in 1761 as an orangery for the Princess Augusta. It was subsequently used as an Australian House, until opened as a Timber Museum in 1863. The collections originated with the exhibits of Colonial timbers from the London International Exhibition of 1862, and were greatly increased, in 1878, by the gift to Kew of a rich collection of timber products from the Indian Government, and of a still more extensive one from the India Office in 1880. The specimens in Museums No. I and No. II are arranged according to natural orders (Bentham & Hooker), and maps are placed in the cases containing them, indicating their geographical sources. In the Timber Museum the collections are arranged geographically. The total number of economic specimens exhibited, other than woods, is about 20,000. The wood specimens (including the timber collections in Museum III, and the smaller wood specimens in the other two museums) number 6,500. A large proportion of these specimens are drugs, but the actual figures are not available.

In 1880, the "North" gallery was completed. This building, presented to the nation by Miss Marianne North, and containing an extensive collection of paintings of tropical and sub-tropical plants executed by her, was opened to the public in July, 1882.

The Laboratory (see Plate X), founded by the late J. T. Phillips Jodrell, and hence known as the Jodrell Laboratory, was commenced in 1875 and completed in 1876. It is used primarily for research purposes, and the following workers, among others, have conducted investigations in it: Burdon-Sanderson, Romanes, Church, Lauder-Brunton, Hugo Müller (chemical constituents of the leaves of *Sabal umbraculifera*), Rev. R. Abbay, F. Darwin, Marshall Ward, Pfitzer, Bower, Cross & Bevan (on cellulose), W. Gardiner, E. Schunck (on chlorophyll), Lord Avebury, G. Massee (on fungal plant diseases), De Wevre (on cubebs, etc.), J. R. Green (on diastase; and other researches), and D. H. Scott (the present Honorary Keeper).

The Herbarium and Library (see Plates X and XV).—It will be remembered that towards the close of Sir Joseph Banks' life, a house, called Hunter House—from the name of its owner, Robert Hunter, a successful man of business who had settled at Kew—was purchased by George III, and added to the Royal property. At the instance of Sir Joseph Banks it was determined to devote this to the accommodation of a botanical library and herbar m, and one

of the rooms was fitted up with book-shelves as a commencement towards carrying out this project. At Sir Joseph Banks' death, however, the plan was abandoned, and the house remained empty until the reign of William IV, who granted it to the Duchess of Cumberland for life. The Duke of Cumberland, who subsequently succeeded to the throne of Hanover, resided in it occasionally, and it accordingly became known as Hanover House. After his death, Hanover House remained unoccupied. When Sir William Hooker took charge of the Gardens at Kew, they were unprovided with any public herbarium or scientific library, the collections that had previously existed there having been dismembered before his appointment, as has already been noted. Sir William Hooker, however, possessed an extensive herbarium and library of his own, which he placed at the disposal of the public, the Government renting a neighboring house, afterwards known as "West Park," for their accommodation, and as a residence for the director. In 1852, though still remaining his private property, the director's herbarium and part of his library were removed to Hanover House. After his death in 1865, his herbarium and library were purchased by the Government at a valuation and added to the public herbarium at Kew, which had been founded in 1854, when Bentham presented his extensive private collection of plants and botanical library to the nation.

The older portion constituting the herbarium building proper was erected in 1877 to take the place of the northern portion of "Hanover House," the oldest portion of all, fronting Kew Green, being now devoted to the library. The west wing, erected on the site of the former students' garden, was completed in 1903.

Since the time of Sir W. J. Hooker's appointment to the directorate, the herbarium has received almost all the collections made by Government expeditions, and it has also been the chief recipient in this country of contributions from British and foreign travellers, as well as from Continental museums, so that its collections now consist of upwards of two million specimens. The expansion of the library has kept pace with that of the herbarium, and it now consists of nearly 20,000 volumes. Of these, twelve hundred are kept in a separate building for the use of the gardeners, and the keeper of the museums has about 700 works of reference in his office.

The Administration of Kew and its Work.

The government of Kew is, so to speak, a dual function. In all administrative matters the Director is subordinate to the Board of Agriculture. The direction and organization of the scientific work of the establishment, on the other hand, devolve upon the Director, whose powers in this direction are absolute. Previous to the deliberations of the Royal Commission on Scientific Instruction and the Advancement of Science, generally known as the "Devonshire Commission" (1871–1875), the functions of the Director had not been clearly defined, but in July, 1872, the relations of the Director of Kew to the First Commissioner of Works and Public Buildings were defined as above by a Treasury minute. The Government department has since then undergone reorganization, but its relations to Kew have not been materially altered. It has already been stated that when Kew was converted into a public institution it was placed under the department of Woods and Forests. This Government department was instituted in 1810, and until 1831 its constituents were known as "Commissioners of Woods, Forests, and Land Revenues"; they were replaced by the "Commissioners of Woods, Forests, Land Revenues, Works and Buildings" from 1832 to 1850, and subsequently the department was divided into the "First Commissioner of Works and Public Buildings" and the "Commissioners of Woods, Forests, and Land Revenues," Kew falling under the former. The Board of Agriculture was established by the act of 1899, and, by an Order on Council of March 28, 1903, Kew was transferred to it from the department of the First Commissioner of Works and Public Buildings.

The Director's staff of officers is constituted as follows:

(*a*) Assistant Director. This post has been irregularly occupied, and is at present unfilled.

(*b*) The Curator of the Gardens, who has charge of the living collections. There are two assistant curators.

(*c*) The Keeper of the Herbarium and Library (eight assistants).

(*d*) The Keeper of the Museums (one assistant).

(*e*) The Honorary Keeper of the Jodrell Laboratory, who is, in a sense, its director, the workers in this laboratory not being, as a rule, on the regular staff at Kew. Permission from the Director of Kew is, however, an essential prerequisite for admission.

The heads of the departments (*b*), (*c*), and (*d*) are directly responsible to the Director for the work done under their care. The organization of the scientific work of Kew is hence of the simplest kind, and resolves itself into departmental government, the departmental chiefs being, in turn, severally and individually dependent upon the Director for their instructions.

In considering the nature of the work done at Kew it will be necessary to adopt a method of rigid selection. A short account will, therefore, be given, in the first place, of the special training provided at Kew for young gardeners, after which the relation with the Colonies will be touched upon, especially with reference to economic plants. Finally, the Kew publications and the facilities enjoyed by scientific workers and others, together with the concomitant results, will be briefly surveyed, in so far as they relate to medicinal plants.

The training of gardeners constitutes the only direct educational work carried on at Kew, but it is of far-reaching importance. Five years previous experience is required of every candidate for admission. The training consists of practical work and lectures. In the former, the student is taken successively through the various sections of the gardens and houses; the lectures are delivered concurrently by the officers or their assistants. The lectures comprise a course in physics and chemistry, as applied to botany and geology; another in general botany; a third on economic plants and their products; and a fourth on geographical botany. During his stay at Kew, the young gardener has to collect, mount, and name a herbarium of 250 specimens himself; at the end of two years he is granted a Kew certificate, provided that his work has been satisfactory. The great importance of this training lies in the fact that Kew is thereby enabled to act as a feeder for the staffs of Colonial and home gardens and other botanical institutions.

The relation of Kew to the Colonies is somewhat peculiar, inasmuch as the botanical establishments of these are in touch with the Colonial office, and do not fall within the jurisdiction of the Board of Agriculture as Kew does. The connection between the two is consequently not very apparent at first sight, but Kew is nevertheless the hub of botanical enterprise in India and the Colonies. The whole key to the situation is simply this, that the Colonial office depends chiefly upon Kew for its scientific advice where

Colonial establishments are concerned, while Kew, on its own initiative, provides the latter with the necessary plants or seeds for the development of new industries, acting thereby as a connecting link between them. The staffs of the Colonial establishments, moreover, are recruited, in the main, from men trained at Kew, so that, although Kew has no official control over these institutions, the bond of union is nevertheless a very intimate one. The functions of Kew in this connection have been so lucidly summarized by M. A. Milhe Poutingon, in a report presented to the French Government, that I cannot do better than reproduce them here:

(1) Kew brings together new species and varieties of economic plants, and selects those from among them that are best adapted for propagation in the Colonies. It is hence an intermediate house and a centre of supplies for Colonial establishments.

(2) Kew supplies, or is instrumental in procuring, botanists and gardeners for the official botanical institutions of the respective Colonies, and also for private ventures. It is therefore a training and recruiting centre in this connection.

(3) Kew advises and supplies information to the Colonies on all matters of botanical and horticultural interest. It is hence a central bureau of information for the Colonies.

(4) Kew, finally, by the example of its own organization, helps to mould that of the Colonial centres, thereby ensuring a continuity of purpose and unity of plan which would not otherwise be attainable. Kew, in a word, may be looked upon as the botanical headquarters of the whole Empire from the cultural point of view.

The Colonial botanical establishments referred to above are of three grades, viz.:

(1) Gardens moulded on the pattern of Kew and administered by a scientific director (*e. g.*, Ceylon, Calcutta, Madras, Mauritius, etc.).

(2) Smaller gardens administered by a skilled superintendent. There are many of these in India, and others in Hong Kong, Demerara (British Guiana), etc.

(3) Up till 1886 these two types were the only ones represented. To these a third type was added in that year, on the recommendation of Kew. This type, known as a botanic station, is organized on a smaller scale than either of the two preceding ones, being under the charge of a trained gardener; it is essentially an experiment station, from which the colonists are able to procure suitable eco-

nomic plants and the necessary information for their successful cultivation on a commercial scale. The botanic stations were first established in the West Indies, and subsequently in the West African possessions. In 1898 the botanic establishments of the West Indian Islands (Barbadoes, Leeward and Windward Islands) were placed under a special department of agriculture in charge of Sir Daniel Morris, K.C.M.G., as commissioner.

In illustration of the role played by Kew in the introduction of economic plants into the Colonies, cinchona and coffee may be taken as examples.

The introduction of cinchona into India, as is well known, was due primarily to the efforts of Clements R. Markham and his associates, who were deputed by the Government to collect young cinchona plants and seeds in the Andes. These were forwarded to Kew, and "upon the Royal Gardens devolved the duties of receiving and transmitting the seeds and plants to India, of raising a large crop of seedlings, of nursing the young stock, . . . and of recommending competent gardeners to take charge of the living plants from their native forests to the hill country of India, and to have the care of the new plantations there. Further, with the sanction of the Indian and Colonial Governments, it was arranged that our West Indian Colonies and Ceylon should be supplied with a portion of the seeds" (Abstract from Sir William Hooker's report to Parliament for 1861). The result is too well known to require further comment.

The work undertaken by Kew in connection with coffee covered a still wider range. In 1862 a coffee disease made its appearance in Ceylon. The Government instituted an inquiry, and a botanist from Kew (Marshall Ward) was dispatched to Ceylon to investigate the disease. His reports having shown that it was impossible to combat the disease, Kew undertook to introduce a variety of coffee from West Africa, known as Liberian coffee, which was of a more resistant nature, and from 1874 to 1876 large consignments of seeds and of seedlings raised at Kew[1] were forwarded in Wardian cases to Ceylon, India, Singapore and the Seychelles. Investigations were concurrently instituted on the habits of the plants in their original habitat, and the results were published in an official report.

[1] These operations are carried on in forcing-houses situated at the back of the Curator's office. (See Plate X.) They are not open to the public.

These two examples may be taken as fairly typical of the rest, which are recorded in the reports of the Director to Parliament, and, subsequently, from 1887 to 1899, in the "Kew Bulletin."

Among the many drug-yielding plants and their products which have formed the subject of investigation at Kew, the following may be mentioned: Eucalyptus, ipecacuanha, the plant yielding euphorbium of commerce, tea, cocoa, opium, tobacco, india-rubber, *Ferula Sumbul*, balsam of copaiba, balsam of Peru, cardamoms, castor oil, chicle gum, arrowroot, *Strychnos Ignatii*, sugar-cane, dragon's blood, frankincense, aloes, cuprea bark, cola, star anise, jalap, vanilla, ginseng, cocoanut oil, derris, Paraguay jaborandi, myrrh, gum benjamin, coca, *Antiaris toxicaria* and strophanthus. A bibliography, by Mr. B. D. Jackson, of the scientific work published in connection with Kew from 1844 to 1895, is to be found in the "Kew Bulletin" for January, 1897, and a supplement thereto in the July number of the same year; to this the reader interested in the subject is referred for details. A passing reference, however, must be made to two works indispensable to every working botanist, whatever his sphere of activity may be, viz., the "*Genera Plantarum*" and the "*Index Kewensis*," in the preparation of which the labors of the ex-Director, Sir J. D. Hooker, have played an important part. The most important publication in the eyes of the pharmacist is, however, the "Kew Bulletin," published under the ægis of the former Assistant Director, Sir Daniel Morris, and edited by the Director. Since 1899 the publication of the "Bulletin" has ceased, although appendices, consisting of lists of staffs, botanic establishments, new garden plants, and seeds for exchange, are still issued. All matters of economic interest dealt with at Kew during the period of 1887 to 1899 are recorded in the "Kew Bulletin," which was "a continuous record of Kew work in all its various aspects" during that period.

Every facility is offered to the research student, whether it be in the gardens, laboratory, or museums, but no provision, beyond that offered to the general public, is made for the elementary student, this function being now relegated to the Chelsea Physic Garden and to the Royal Botanic Society's Gardens in Regent's Park. Among the many authors of eminence whose works are largely based on the facilities provided at Kew, the following may be mentioned: Daniel Hanbury, who frequently visited Kew in connection with the "Pharmacographia," of which he was joint author; Triana, who

consulted the collections at Kew for the preparation of his work on Cinchonas; J. E. Howard, the author of classic monographs on the genus *Cinchona;* Bentley and Trimen, whose well-known work on medicinal plants contains numerous plates of plants figured from the Royal Gardens; Sir George Watt, the author of the "Dictionary of the Economic Products of India," who is at the present time working at Kew; and last, but not least, Mr. E. M. Holmes, the veteran pharmacognosist, one of the most indefatigable investigators of the riches of Kew.

Kew, finally, is under constant requisition by manufacturers, druggists, and drug-brokers, on questions of economic botany which affect their respective callings.

[There is no connected account of Kew at present available, most of the literature on the subject consisting of scattered collections of facts from which it is extremely difficult to construct a coherent record. To the student who is desirous of pursuing the subject further, the following list may be of use, as it includes the most important works on the subject:

Historical account of Kew to 1841, by the Director, in the "Kew Bulletin" for December, 1891. Contains copious citations from the earlier literature.

The annual reports of the Director of Kew Gardens to Parliament from 1850 to 1882. Index to reports (1862–82) on page 3 of "K. B." for 1890. Irregular reports of varying nature (in Parliamentary Blue Books) from 1844 to 1850.

"Kew Bulletin" from 1887 to 1899.

Popular Guide to the Royal Botanic Gardens of Kew—1st to 21st editions, by the Director of Kew (1847–1862); 22d to 30th (the last published) editions, by Prof. Daniel Oliver (1863–1885). This excellent little work has long been out of print, and copies of it are scarce.

John Smith: Records of the Royal Botanic Gardens, Kew, 1880. An account of the old "Botanic Gardens" during the official connection, as curator, of the author, between the years 1822 and 1864. Controversial and scarce.

Report to the Lords Commissioners of His Majesty's Treasury of the Departmental Committee on Botanical Work and Collections at the British Museum and at Kew, 1901. Contains a summary of previous enquiries, a bibliography, and an elaborate memorandum by the Director of Kew. Parl. Return. Commons, No. 205.

The various hand-lists of the living collections, published at Kew, also contain interesting summaries of the way in which the respective collections originated, but most of the information under this head will be found in greater detail in the "Kew Bulletin." A complete list of the hand-lists will be found in the Parliamentary Report previously cited.]

[*To be continued.*]

THE U. S. PHARMACOPŒIA FROM THE POINT OF VIEW OF THE ANALYST AND AS A LEGAL STANDARD.

By Henry Leffmann, Philadelphia.

After a prolonged and wearying delay, the eighth decennial revision of the U. S. Pharmacopœia has appeared. It is an octavo volume of about 700 pages, including indexes and introductory matter. It is not apparent to the outsider why such a work required five years for its preparation. There may be safety in a multitude of counselors; there is apparently not celerity. The relation of the Pharmacopœia to chemistry has been growing closer with each revision. The thin duodecimo volumes that appeared in the first half of the nineteenth century, wisely avoided the battlegrounds of chemical notation and nomenclature. Formulas were ignored; distinctions between such bodies as mercurous and mercuric chlorids were obtained by the simpler and safer means of titles suggesting properties. The growing tendency to make the Pharmacopœia a reference work in chemistry cannot be regarded with indifference or approval. The need of the present day is, concise, accurate, reference works. By the elimination of irrelevant matter the book might have been reduced one-third. By a corresponding reduction of price, an increased circulation might have been obtained.

The Pharmacopœia is in some respects an anomalous work. It is primarily intended for the guidance of physicians, yet comparatively few see it and still fewer study it carefully. It devotes much attention to analytic methods, yet it is but little used by those in general analytic practice. Its date is always a misnomer: the present issue is commonly called the Pharmacopœia of 1900, but went into effect on September 1, 1905!

To those who have some knowledge of the history of chemistry and pharmacy, the book has a sentimental interest apart from any critical interest or usefulness. Its monkish Latin preserves the memory of a time when that language was the established channel for the distribution of scientific data; in fact, the first issue (1820) was bilingual, the formulary being in Latin and English on facing pages. Nothing of this remains but the titles, but even these give a medieval flavor, and suggest faintly the Dryasdusts. Enough also remains of the older chemistry to recall the period of the first issue, when the imperfect nomenclature that resulted from faulty trans-

literation of the French system, had introduced the unnecessary genitive construction into many common names. In the current edition these ancient forms contrast strongly with some ultra-scientific and even fantastic structural formulas.

By contrasting the first and current issues, it is easy to note the translation of the control of it from medical to pharmaceutic authorities. The first edition was prepared wholly within the medical profession. Pharmacists were not mentioned in the call for organization and every delegate had the degree of M.D. The Pharmacopœia of 1900 is distinctly a pharmaceutic production. The authority for its publication rests with the "Committee of Revision," composed of twenty-five persons. Eleven are given in the list with the degree of M.D., but of these, four represented pharmaceutical organizations in the convention, and at least two others are not in medical practice.

These points are, however, largely sentimental and it is necessary to proceed to the subject-matter of the paper. An analytical manual should be comprehensive and precise, with as much conciseness as is consistent with clearness. All the obligations of professional life are burdensome at the present day. The practical analyst who desires to give his clients the best service and to hold them to his interest, must be a member of several societies, a subscriber to several journals, and must be continually adding to his library. He ought to be spared unnecessary expense in these lines. The same is true of the druggist. The Pharmacopœia is a work that every druggist should possess. An effort should be made to keep its cost within low limits.

As an analytical manual the Pharmacopœia is much too elaborate in some ways and insufficient in others. It is not a manual of drug analysis, for it includes only those drugs that are, or are supposed to be, in use by physicians. It is further limited by the fact that only one school of physicians is consulted. Remedies used largely by many physicians not of the regular school are wholly excluded. It carries the analysis of some articles to a degree of elaboration beyond the requirements of practical work.

The literary style is objectionable in some ways. While there may be no serious criticism on the general literary form, there is quite too much turgidity and prolixity of expression. The formal and elaborate phrases in the specific definitions may be pardoned.

They are not only interesting relics of past methods, but they are perhaps advisable as aids to memory. The analytic notes and comments should have been given in concise and simple language; "iteration" should have been avoided. In any scientific work, effort should be made to avoid multiplication of terms. The terminology of science grows fast enough from unavoidable causes. He that introduces two terms where one would serve let him be anathema. The framers of the Pharmacopœia have violated this rule in several ways. For years, chemists have found such expressions as "normal silver nitrate," "decinormal potassium hydroxid," or their obvious abbreviations: N; N/10, sufficient for descriptive purposes, yet the Pharmacopœia must introduce the cumbersome "tenth-normal silver nitrate, V. S.," a tautology, at the least, for tenth-normal can be nothing else but a volumetric solution.

The work has been encumbered with a list of "test-solutions"—distinguished by the abbreviation "T. S." Many of these are the ordinary reagents of the laboratory the exact strength of which is of minor moment, and the preparation of which does not need description for either pharmacists or analysts. The preparation of starch solution is given in awkward form; it is much more convenient to stir the starch in cold water and add this to the boiling water, than to reverse the process. Moreover, attention is not called to the fact that starch solution can be preserved for a considerable time, as Moerk has shown, by the use of a little oil of cassia. All the descriptions of the preparation of test and volumetric solutions are prolix and on the style of an elementary manual. The Pharmacopœia is a book for persons more or less experienced; this elementary instruction is redundant, adding to the bulk and, therefore, to the cost.

A serious, inherent, defect of the book from the analyst's point of view is the infrequency of publication and the complicated system by which any revision must be brought about. It has long been evident to many that the ten-year interval is too long for even the needs of general medicine or pharmacy, but it is absurdly long for a book that relates to practical analysis. This department of science goes on by leaps and bounds. A manual that applies to it should be under the supervision of very few persons and should be issued in limited editions that will permit of frequent revisions. Two years, or at most three years, is the efficient life of an analytical manual.

The last convention provided for supplements to the Pharmacopœia, but this will only afford slight relief. It will be five years until a thorough revision can be undertaken and it may be a dozen years before the revision appears, for the revision of 1890 appeared in 1893, that of 1900 in 1905, and at this rate the issue of 1910 will be due in 1917.

Among the special features that are deserving of strong disapproval are the introduction of structural formulas and the use of the hydrogen system of atomic weights.

What possible advantage can accrue to any user of the book from the introduction of such an expression as $CO.(OLi)_2$? Many trained analysts will be obliged to look twice before recognizing lithium carbonate under this hodge-podge. The force of pedantry run mad could hardly go beyond $2(C_2H_2(OH)_2(COOK)\ COOSbO) + H_2O$ or $CH_2O_2 . C_6H_3 . CH : CH . CH : CH . CON . C_5H_{10}$. The first is tartar emetic. If any one recognizes it, this is probably on account of the symbol Sb and not for any understanding of the formula. The second formula is piperin.

It would be interesting to know under whose mismanagement these abstruse and useless formulas were introduced.

By the adoption of the hydrogen standard for atomic weights, all quantitative measurements are put out of accord with those in the preparation of standard solutions as given in the official bulletin of the U. S. Department of Agriculture and of the numerous dependent experiment stations and many analytical manuals.

A commendable reform has been made in the use of "hydrochloride" instead of "hydrochlorate" for alkaloidal salts. Similarly, the restoration of the proper spelling of naphthol and naphthalene is to be commended. It would have been well if the spirit of reform in spelling had stirred the committee more deeply and secured the elision of the useless final "e" in halogen salts and names of alkaloids, but we must be thankful for small favors.

It is to be regretted that the spirit of classicism was so strong that words such as "methyl" and "kaolin" were not made indeclinable. The Latin terminology of pharmacy, slight as it now is, is burdensome, and there is good precedent for simplifying along this line. The whole genitive construction of binary compounds might have been sent by the board. This has, in fact, been done in many English names; why should it not have been done in the

Latin? A few pedants might have protested, but the Latin of the Pharmacopœia has no necessary allegiance to the language of Horace and Quintilian. To the great mass of pharmacists and physicians Latin is not merely a dead language, it is a decomposed one. "Sodium chloridum" would serve as well as "sodii chloridum."

The change from "liquor potassæ" to "liquor potassii hydroxidi" represents no gain in applied pharmacy; moreover, the revisors are not consistent; "liquor calcis" is unchanged. There should be at least a method in the madness of the changes. In the change from *acidum arsenosum* to *arseni trioxidum* a step has been made from one bad form to another. To call the common white arsenic the trioxid when it is a sesquioxid is to add confusion to chemical nomenclature. The older name was objectionable, but the new one is as much so. If *ferri hydroxidum* is acceptable, why should not *arseni sesquioxidum* be equally so? Even *arseni oxidum* would have been better than the given name. Such a non-committal form is adopted in the case of the iodid, which is arsenous iodid and is called simply *arseni iodidum*.

The introduction of many articles belonging essentially to the category of crude drugs adds unnecessarily to the size and cost of the book. The items of the Pharmacopœia should be limited to substances used as medicines, which will, of course, include external as well as internal remedies. Materials which are merely used for extraction purposes, for tests or for the preparation of other remedies by mere dilution, need not be enumerated. Among the substances which would be excluded under this rule are: acetone, acetic acid (glacial and 36 per cent.), strong hydrochloric, nitric and sulphuric, nitrohydrochloric, nitric and sulphuric, nitrohydrochloric and phosphoric acids, oleic acid, absolute alcohol, stronger ammonia, water, bromin, ferric oxid with magnesia, gun-cotton, sublimed sulphur, crude and purified petroleum benzin, paraffin, liquefied phenol, lead nitrate, lead iodid.

It may be said that the control of the purity of preparations must be attained through control of the purity of the original materials, but the methods of the pharmacist can never go to the first condition. He will always rely on the manufacturer at some point, and the purity of a preparation can be as well controlled in the preparation itself as in the crude source. Under "diluted sulphuric acid" it is stated that it should "respond to the reactions and tests for

(strong) sulphuric acid." The tests, however, can be applied as well to the dilute as to the strong acid; indeed, most of them are applied to the latter by considerable dilution, and the pharmacists can control the dilute product perfectly. At the present day any pharmacist can obtain at moderate cost pure strong acids; minute tests, such as those for nitrous compounds in sulphuric acid, are unnecessary.

Much attention has been devoted to the tests for purity of the preparations. This has always been a difficult point in the Pharmacopœia. In some former editions serious errors have been made and injustice has been done. It is too soon to determine how far the new edition has accomplished better work. The Pharmacopœia is always issued under a sort of star-chamber control. Only a few persons are taken into confidence, and the bulk of the medical and pharmaceutical profession finds material for much surprise and astonishment when the book appears.

On some points, however, issue may be taken at once; they are so obviously amiss. I instance first the tests for the purity of water.

The work specifies "water" and "distilled water." The former is defined to be "potable water in its purest attainable state." As we are not informed upon what basis the limitations as to purity are fixed, this definition is vague and ambiguous. We turn, therefore, to the analytic notes. To any one familiar with water analysis, the rubric seems to be more a product of the library than of the laboratory.

In the first place, the sample must be a colorless, limpid liquid, without odor or taste at ordinary temperatures and odorless when heated. Very few potable waters will conform to these requirements, and many that will not are entirely safe for pharmaceutic uses. One gains an idea from this statement that the intention is to include under the title only natural waters of exceptionally high purity, but a few lines below the limit of total solids is given as 500 parts per million. This is equivalent to 29 grains per gallon, an amount unusual in natural waters, except from deep sources. Yet even with this limit the water must be neutral to litmus paper, a condition to which high-class natural waters will not conform, and yet for the rejection of which no good reason seems to be offered.

The total solids of the water are to be determined by a method that is not in use by analysts and is tedious and inconvenient,

namely, the evaporation of 1,000 c.c. on the water-bath. If a determination of total solids is to be made it should be done in a platinum basin and 100 c.c. evaporated. No proper test of this kind can be made without a good balance, and there is nothing but disadvantage in evaporating 1,000 c.c., especially when the question is merely a rough ascertainment for control. The text further states that the residue must not blacken nor emit ammoniacal or acid fumes. Very few natural waters will fail to give upon evaporation of 1,000 c.c. a residue that does not blacken.

It appears, however, that while a high limit is fixed for the solids, the sample is scarcely allowed to contain anything that is usually present in natural waters. Some limits are fixed at almost vanishing points. Thus, for nitrates the delicate and inconvenient diphenylamin test is given. This will probably exclude most natural waters, even the high-class spring and river waters of this region. The limits for sulphates and chlorides seem to be chosen with more regard to uniformity in the reading matter than in the standards. In each case 200 c.c. of the sample is to be taken and 0·5 c.c. of the particular reagent added. In the chloride test, decinormal silver nitrate (or, to quote the stuffy phrase of the book, "tenth-normal silver nitrate V. S.") is directed. In both tests the liquids must be heated to boiling, cooled and filtered. For the actual purpose of these tests, boiling is not needed, and it is especially out of place in the case of the test for chlorides. The direction to filter the liquids before applying the second phase of the tests is also an excess. If the turbid liquids are stood aside for a short time (the chloride test in the dark), a few cubic centimeters of the clear liquid can be decanted and the test applied.

There seems to be a marked inequality between the limits allowed for sulphates (100 parts per million, calculated as SO_4) and chlorides (8·87 parts per million, calculated as Cl). These limits do not seem coördinated nor based on the study of analytic data.

For the nitrite test the naphthylamin reaction is given. This is a test of extreme delicacy, troublesome in application, at least so far as the preparation of the reagents is concerned. No caution is given as to the liability to error from the common occurrence of nitrites in air and dust, nor is it pointed out that deep waters will often give marked reaction for nitrites, and yet be unobjectionable. In fact, the whole water-rubric indicates that its authors are unaware that

the standards of purity in water are correlated with the class to which the water belongs. The tests for ammonium compounds and oxidizable organic matter are also under the same spell.

The absurdity of these standards for purity becomes still more glaring when the tests for distilled water are examined. The editor of this part seems to have an idea that the nitrates, nitrites and ammonium compounds often found in water are in themselves objectionable; whereas they are merely indexes of past impurity. In the case of distilled water, small amounts of the above compounds can have no significance. The application of difficult and delicate tests will produce nothing but confusion and, perhaps, the rejection of a sample that is entirely suited to pharmaceutic purposes.

It is certainly strange that those members of the committee of revision who have been for years in general analytic practice allowed such absurd rubrics to appear.

In a recent communication a member of the revision committee has endeavored to explain some of the features of the water-rubric, among others the allowance of 75 parts per million for fixed solids (in distilled water), for which the absurd requirement that 1,000 c.c. of water should be evaporated is again given. Seventy-five parts per million are equivalent to over 4 grains per United States gallon, an amount larger than that in many spring and river waters of the United States. As by further statement in this rubric, it appears that the water is not permitted to contain anything that is likely to be present, the total solids are more easily imagined than described. It will be interesting to know why a small amount of carbonic acid is objectionable, and also how the stock of distilled water, the container of which must be frequently opened to the air, can be prevented from acquiring some of this substance.

The above-mentioned defense of the water-rubric stated that the reason for allowing the large margin for the total solids is the action of water on glass. It may be said, however, that a sample which has dissolved so much of mineral matter is no longer pure water, and should not be approved as such. This reason for the liberal allowance sounds a little strange in comparison with a general requirement in regard to reagents, namely, that they should be kept in bottles not subject to corrosion by acids or alkalies. It will be found difficult to meet this requirement.

As an example of excessive elaboration of tests, I wish to instance

the rubric on apomorphin hydrochlorid. It gives the solubility of the salt in several liquids that would not be used for dissolving it in medical work, together with the melting and even the decomposing point, the latter certainly of little interest. Sixteen tests are given, several of them with unusual and expensive reagents, and almost all of them of interest and value only to the specialist in pharmaceutic chemistry or toxicology.

Some of the tables also exemplify the tendency to absurd and useless detail. Chemical calculations are carried out to the sixth decimal place, although it is well known that the atomic weights on which these calculations depend are not positive beyond the first decimal. In a tabular comparison of thermometric degrees, many equivalents are given to the fourth decimal, *e. g.*, 211·4444. For the general work of the analyst thermometers reading to one-tenth of a degree are the best available. To carry out the degrees to the ten-thousandth is mere arithmetical gymnastics, adding to the expense of the book without adding any advantage.

If I regard the Pharmacopœia in its present form as unsatisfactory to the analyst, it is in a still more unfavorable light that I regard it as a legal standard. Its errors of omission and commission in analytic methods can be supplemented by the knowledge of the worker or by regular analytical manuals, and, as a last resort, by special circulars and journal articles; but its errors as a work of authority must stand until remedied by the parent body. I regard the work as dangerous in its legal relations. I have known it to be an instrument of oppression. By its very nature it is liable to this misuse. In spite of all the circulation that it receives, it has a certain air of mystery. Its very name savors of the black art. A little knowledge of Greek informs us, of course, that it means merely "to make the drug," but Greek is the possession of but few.

The manner of publication of the book gives it a factitious authority and the use of the word "official" adds to this. We are reminded of Sir Joseph Porter's observation that "it is the characteristic of this happy country that official utterances are unanswerable." The book is supposed by many to represent the collective wisdom of medicine and pharmacy; but the method by which the convention is called destroys much of the dignity of it, for a general invitation is extended, including all grades of schools of medicine and pharmacy and of medical and pharmaceutic societies. The

great trade interests sure to be on the alert; they can afford to send a full complement of representatives and insist on their zeal and activity. Standards, therefore, may be framed to suit such interests.

A primary and inherent fault in the Pharmacopœia as a legal standard is the same as that pointed out with regard to its use by the analyst, namely, the infrequency of publication. Ten years, even five, is much too long an interval. Trade conditions change and these changed conditions should be met promptly and fully. The method of establishing standards by governmental proclamation is not wholly satisfactory, but it is much better than the system of establishing them by a book which can only be corrected by the formal action of more than two dozen persons scattered over a wide area.

The injustice that has been worked by the use of the Pharmacopœia as a legal standard has been so apparent that the framers of the current edition have made a formal statement that it is to be considered such only so far as the substances are used as drugs. It is a matter of doubt whether this waiver will avoid the trouble. In some of the laws enacted to prevent adulteration the statement is made, substantially, that an article sold under a name which occurs in the Pharmacopœia must conform to the requirements of that work. The law does not consider the *use* to be made of the article. Moreover, there is no certainty that all courts will concede the validity of the waiver. The law has its own methods which are not always foreseen or even comprehended by those not in that profession. In an Ohio case a druggist was charged with the sale of an article that did not accord with the then current (1890) Pharmacopœia, but did accord with the issue that was in use when the law was passed. A conviction was obtained, but a higher court set aside (and I think justly) the verdict on the ground that the Pharmacopœia mentioned in the act was the one in force at the time the act was passed and not some issue not in existence and of which the enacting body was unaware.

A definite instance of the ease with which the book can be used harshly was shown in a trial for selling "extract of vanilla." The sample did not conform to the standard for "tincture of vanilla" in the Pharmacopœia. The expert for the prosecution took the ground that this latter was the proper standard for preparations sold for flavoring purposes. He admitted, on cross-examination, that "ex-

tract of vanilla" is not referred to in the work but, nevertheless, maintained that it was covered by the title, and secured a conviction, which was, however, set aside and a new trial allowed. The Commonwealth never pressed the case to a second contest. The attitude of the judge and jury in this case was evidently due to the factitious authority that had been acquired by the work.

DOSES IN THE U.S.P.

By M. I. Wilbert,
Apothecary at the German Hospital, Philadelphia.

For the second time in the history of our National Pharmacopœia, doses have been appended to the monographs or descriptions of the official substances. The first attempt in this direction was made in connection with the first revision of the Pharmacopœia of the United States of America, published in New York, in November, 1830. In this early first revision of the U.S.P. doses were appended only to the articles that were enumerated under the heading "Materia Medica," while in the present eighth decennial revision doses are appended to all medicinal substances or preparations that are intended for internal use.

One other difference is to be found in the fact that in the present edition of the U.S.P. the figures that are given indicate the average adult dose, while in the first revision the usual variation of the doses is indicated.

The National Convention for revising the Pharmacopœia instructed the present Committee on Revision "To state the average approximate (but neither a minimum nor a maximum) dose for adults, and, when deemed advisable, also for children. The metric system to be used, and the approximate equivalents in ordinary weights or measures inserted in parentheses."

In following out these instructions the members of the Committee on Revision have appended average doses to 752 drugs and preparations. Twelve of these drugs and preparations have two widely varying quantities appended, thus making a total of 764 doses included in the present Pharmacopœia.

Of these 764 doses 405 are directed to be given by weight, 342 by liquid measure, 15 by count, while two, the doses appended to antidiphtheric serum, represent units of antitoxic power.

Just what the members of the present Committee on Revision consider to be metric quantities is perhaps best illustrated by a summary of the figures given in the Pharmacopœia as average doses, and an enumeration of the number of times that each quantity reoccurs.

Doses by Weight.				Number of Times Mentioned.
0·00015	gramme	= 1/400	grain	1
0·0003	"	= 1/200	"	1
0·0004	"	= 1/160	"	2
0·0005	"	= 1/128	"	7
0·001	"	= 1/64	"	5
0·002	"	= 1/30	"	3
0·003	"	= 1/20	"	3
0·005	"	= 1/10	"	8
0·008	"	= ⅛	"	1
0·010	"	= 1/5	"	17
0·015	"	= ¼	"	5
0·030	"	= ½	"	16
0·045	"	= ¾	"	2
0·065	"	= 1	"	32
0·100	"	= 1½	grains	2
0·125	"	= 2	"	23
0·200	"	= 3	"	10
0·250	"	= 4	"	64
0·500	"	= 7½	"	49
1·00	"	= 15	"	78
2·00	"	= 30	"	51
3·00	"	= 45	"	1
4·00	"	= 60	"	16
8·00	"	= 120	"	8
15·00	"	= 4	drachms	1
16·00	"	= 240	grains	8
30·00	"	= 1	ounce	1

Doses by Measure.				Number of Times Mentioned.
0.008	c.c.	= ⅛	minim	1
0·030	"	= ½	"	2
0·050	"	= 1	"	18
0·100	"	= 1½	minims.	15
0·200	"	= 3	"	40
0·300	"	= 5	"	6
0·5 0	"	= 8	"	28
0·600	"	= 10	"	3
1·00	"	= 15	"	63
2·00	"	= 30	"	62
4·00	"	= 1	fluid drachm	42
8·00	"	= 2	" drachms	25
15·00	"	= 4	" "	1

16·00	c.c.	= 4	fluid drachms	27
30·00	"	= 1	" ounce	4
60·00	"	= 2	" ounces	1
120·00	"	= 4	" "	3
360·00	"	= 12	" "	1

Doses by Count.

2 pills	11
1 pill	3
Set of two powders	1
Antitoxin units	2

A comparative review of the above table evidences the fact that the minimum average dose, for an official substance, is 0·00015, or 0·15 milligrammes. This minute quantity is the average dose given for the now official crystalline aconitine and is followed by 0 0003, the official average dose for strophanthin. The bulkiest dose for a solid is that given for pepo, 30 grammes.

The smallest official dose for a liquid is that for the volatile oil of mustard, given in the Pharmacopœia as 0·008 c.c., a quantity that, under present conditions would be rather difficult to imagine.

The largest official dose, on the other hand, for any of the official articles, is that given for the solution of magnesium citrate, 360 c c. A more careful, comparative study of the table of dose quantities must suggest the fact that the members of the Committee on Revision have not been particularly fortunate in the selection of the quantities that are supposed to indicate average doses in the metric system. Thus, for instance, we find such quantities as 0·008, 0 045, 0·065, 0·125, 0·60, 3·00, 4·00, 8·00, 16·00, 30·00, 60·00, 120·00, 360·00. Many of these recur repeatedly, but never once do we find such quantities as 5·00, 10·00, 25 00, 50·00 or 100·00.

This absence of decimal figures, in some instances, is the more apparent when we realize that the committee appears to have taken cognizance of the fact that decimal quantities are of advantage, and has selected 1·00 gramme or 1·00 c.c. as the unit of quantity in a very large number of instances. Thus we find that 1·00 gramme occurs no less than seventy-eight times while 1·00 c.c. occurs sixty-three times, as the average dose of official articles.

A slight discrepancy is also to be noted in the difference of opinion that appears to exist in connection with the quantities used to indicate the metric equivalents of 1 grain and 1 minim.

In giving the average doses by measure the committee has invariably given 0·05 c.c. as being the equivalent of 1 minim. In

giving the doses by weight the members of the committee have, apparently, been more exacting and give 0·065 as the equivalent of 1 grain; they do, however, give 0·01 as being the equivalent of 1/5 grain and 0·005 as being the equivalent of 1/10 of a grain.

In only two instances is the quantitatively more correct, and at the same time the more reasonably decimal, quantity 15·00, mentioned as being the equivalent of half an ounce; by weight for chondrus, and by measure for syrup of ipecac as an emetic.

Quite a number of additional features might be referred to in connection with the above table of dose quantities; what has been said, however, will serve to show that while the members of the Committee on Revision have succeeded in giving us a practical solution of the much-dreaded question of official doses, and while they have also contributed materially toward advancing the use of the metric system in medicine, in this country, they have not been altogether successful in the selection of quantities indicative of approximate, average metric doses.

In conclusion, it may be of interest to enumerate just a few of the doses included in the first revision of the U.S.P., published in 1820, comparing them with the quantities given as average doses, seventy-five years later, in the eighth decennial revision, published in 1905. To facilitate comparison all of the quantities are given in grains:

Name of Drug.	Dose in grains, U.S.P., 1830.	Dose in grains, U.S.P., 1900.
Aloes	5 to 15	4
Asafetida	5 " 20	4
Belladonna leaves	1 " 5	1
Camphor	5 " 10	2
Cantharides	½ " 1	½
Capsicum	6 " 10	1
Cinchona	10 " 240	15
Colocynth pulp	4 " 10	1
Colchicum	1 " 4	4
Cubebs	60 " 90	15
Digitalis	1 " 3	1
Ipecac	10 " 30	15
Jalap	10 " 30	15
Nux vomica	2 " 5	1
Opium	1 " 4	1½
Rhubarb	5 " 40	15
Senega	20 " 40	15
Senna	20 " 60	60
Squills	1 " 60	2
Arsenic trioxide	1/10 " ¼	1/30
Phosphorus	⅛ " ¼	1/128

THE PROTECTION THAT SHOULD BE AFFORDED THE PHARMACIST BY LAW.

By C. P. Gabell.

The world is ever ready for an advance, be it in inventions, in science or in trade. Once it grasps the fact that what is presented is an actual improvement, the success of that advance is assured.

The present condition of the pharmaceutical trade is open for improvement, and it rests with the pharmacist to present such an improvement to the public. Just what step should be taken or what should be done is a question which is being debated throughout the country and action being taken with the result that to-day we have an organization comprising the greater number of the pharmacists of the country. Several lines of action are being carried out with varying results, the main one being the endeavor to raise the price of patent medicines over the present existing prices, with the idea that the increased revenue would benefit the business; this measure will no doubt be beneficial, but only to a degree. I have never favored this action, because in it I can see no permanent good. It is a branch of the business which savors of deceit, has not the approval of the best and well-thinking minds, and to-day is being radically criticised by our magazine writers.

I have to present to you an idea which I have presented to individuals both laymen and pharmacists, and it has been received with approval by the majority. I favor action along legislative lines and offer this contention.

Pharmacists should be the dispensers of all poisons and products containing poisons to the laity. This carries considerable breadth in the statement and may be construed to be very radical, but when we go back to the inception of why a poison law was ever framed, we find it was not made to favor a few men in a chosen business or profession, but was intended to safeguard the general community from doing itself harm or causing others harm. We find that conditions existing to-day are the same as in the past; we find also that instead of poisons and allied products passing through qualified and experienced hands they are being dispersed indiscriminately by photo-supply houses, grocers, department stores, seed stores, hardware stores and others, to the detriment of that class of men who have qualified themselves to handle these articles intelligently.

In reading our present Pennsylvania pharmacy law, it states that only pharmacists shall sell drugs and poison, and dispense same; we read further and we find it says this shall not apply to anything used in the arts, so we have this condition existing: A person wants cyanide of potash, he comes to a druggist who makes the sale according to law and its requirements, which are burdensome, and soon that customer finds he can buy the same cyanide for the same or less money, outside of the drug business, without any burdensome questions or mortifying signatures. And what is true of this chemical is true of a host of others; for instance, all the dyestuffs, all the insecticides, the electrical chemicals, in fact, the volume of material which is sold by qualified drug and chemical men as compared with the volume of material used is infinitesimal, and I feel that what is needed to elevate and carry the drug business from its present dearth and sloth to a condition of prosperity is not an increase of profits as much as a re-collection of this lost business back into its proper channel.

In advocating my idea to people I have presented this argument: "The drug business is in a bad condition. We are not making money. Will you pay me $1 for what you are now paying 85 cents?" The invariable answer is: "Why, some men are making money in your line at the present prices, and if you are not bright enough to get the money out of your business, I cannot help you; as long as I can buy for 85 cents I will not pay $1." Again, "the drug business is in a bad way. We are men educated and specially qualified to sell poisons and articles containing poisons, and to sell them to you we are required to register your name, etc., but due to the faulty wording of the present law, you can obtain these articles with no inconvenience, from other dealers. Now, do you prefer that these unqualified dealers shall furnish this material, knowing they have not the necessary knowledge to caution you in their use and capable of satisfying themselves you understand fully how to handle the product without harm to yourself or others, or would you prefer these products to be handled by the qualified men?" And receive this answer: "By qualified men." "Will you help us by your influence and vote to secure this condition?" And the answer has been, "Yes."

A physician is a qualified man; so is a lawyer, minister, the saloon-keeper and the plumber. No man can enter these pursuits

without qualification either in the shape of a diploma, a license, or a registration. Any one doing so renders himself liable to fine and imprisonment; but the pharmacist is lured on to a college education and a diploma and graduates a qualified man to find his business usurped by the unqualified man without any redress at hand.

Some have said that my statement of poison and poisonous products for pharmacists would be class legislation, therefore unconstitutional. It is not class legislation any more than that which applies to lawyers, physicians and other classes referred to, and while it will help pharmacists it will help the general community more, the same as it has in the classes mentioned.

If you have been reading the public press you will find more and more cases of mysterious poisoning occupying the attention of the public, showing that the wide distribution of poisons outside of a regular channel is producing crime which is undetectable.

The present laws which are being pressed requiring a prescription from a physician I do not approve. It is simply taking the sale and distribution from the hands of the pharmacist and placing it in the hands of another set of men, practically saying pharmacists have not the moral courage to properly conduct their business; but physicians are such a higher type of men, they are the proper ones.

We are fined $100 for selling cocaine, but the physician may prescribe or sell it himself "ad libitum" without punishment. I offer you the criminal annals to prove if this be a good law.

Much has been said about the dispensing physicians; by the securing of such a law much of this evil would be remedied. The sentiment among physicians is against giving of their own medicines as it means extra trouble and expense; but what one does forces the other to follow. If such a law were established it would be unlawful for a physician to dispense, and while I am aware it would be next to impossible to stop the practice altogether, nor is such my intention, but the moral force of having such a law would bring it to its normal, healthy level, the same as our city ordinance against expectoration has brought spitting from a disgusting and unsightly abuse to a condition of fair cleanliness.

Another point which appeals to all sane men is that no one man can know it all, and there is a place for the special work done by the pharmacist. As a suggestion along the lines I am following would it not be well for our Board of Pharmacy, while bothering

themselves to know if every man calling himself a druggist is employing qualified help in the shape of Q. A. and P. D. back of his prescription department, to determine if the same class of work is being done by the same class of men in our manufacturing plants, thereby fulfilling the present law and bringing about an equitable cost of production between the manufacturer and retail pharmacist. This is only a suggestion. Also, do dental companies employ a registered pharmacist in their drug departments, and if not, why not, under our present law? Also, are the many preparations put up and sold by chiropodists, barbers, manicurists, great numbers of which contain poison, prepared by themselves or qualified men? And is the sale of such preparations legal?

Much complaint is heard of the lack of competent help. Time was when men paid to have their sons learn the trade. Why? Because it was understood to be a law-protected business carrying with it a fair remuneration and the highest social position. To-day all that may be offered is a nominal salary of $16 to $18 a week after graduation with only a slight advance over these prices in remuneration as a proprietor. Any movement for reform to meet with proper approval must have an underlying principle of a moral or ethical character; pure mercenary motives seldom achieve success, and until the pharmacists of the country become alive to the fact I look for little improvement from our organization.

Gentlemen, the druggists of the country to day need to make *poison* their watchword. *Poisons.*—We are the sellers and dispensers of poisons to the laity; nobody else should handle same. Our qualification and diploma give us this privilege and so must the law. The day for being the compiler of physicians' prescriptions only, has passed; the manufacturing pharmacist with his machinery has changed this, but as a distributor of poison and poisonous products in your neighborhood you have a place; it is a place which may have to be fought for, but when attained we will have more use for college-bred men. We will have control of all patent medicines and innumerable articles which we have not now, and then our organization, working on a solid foundation with a trade which controls its products by law, can talk the betterment of prices and trade conditions with some assurance of success.

You then will not stand before the public as sellers of 5 and 10-cent articles, cigars, soda water and penny-worth of candy, but

will be able to take your place socially among physicians and your fellow men.

With our trade organization, our colleges, the assistance of all right-minded physicians and the enlightened public, there is no reason why such a law should not be passed and the business, or profession as it really is, re-established and take its proper place in the community: The care of the sale and the distribution of *poisons* and *poisonous* products.

BOOK REVIEWS.

THE PRACTICE OF PHARMACY. A treatise on the modes of making and dispensing official and unofficial, and extemporaneous preparations, with descriptions of medicinal substances, their properties, uses and doses. Intended as a hand-book for pharmacists and physicians and a text-book for students. By Joseph P. Remington. With over eight hundred illustrations. Philadelphia: J. B. Lippincott Company. London: 5 Henrietta Street, Covent Garden.

It is exactly twenty years since the first edition (October, 1885), of Remington's Practice of Pharmacy was published. The first edition was written after the author had been Professor of the Theory and Practice of Pharmacy in the Philadelphia College of Pharmacy for eleven years. The time was ripe for the publication of a book which could at once be used by the student or apprentice in qualifying himself for his professional work and by the pharmacist as a work of reference.

It is usually conceded that no other work on pharmacy has had such a large sale, and this sale must be taken as a measure of its success and general merit. It is adapted to the needs of a larger number, and contains probably a larger amount of general information, which the pharmacist is likely to need in the course of his ordinary routine business than any other book on pharmacy that has been published. In fact, besides being primarily a treatise on the principles of pharmaceutical practice, it is more or less of a dispensatory or commentary on the Pharmacopœia without its being burdened with much of the matter contained in the dispensatories, which is only occasionally referred to. Besides containing practically everything in the U. S. Pharmacopœia, it contains the formulas of the National Formulary, a formulary of unofficial preparations

and considerable useful information on various non-official chemical substances, as well as articles of the vegetable materia medica.

Nearly three hundred pages are devoted to the discussion of the various pharmaceutical operations, as distillation, solution, filtration, percolation, etc. Over two hundred pages are given to the consideration of magistral or extemporaneous pharmacy, this part having been enlarged by the addition of a new chapter on "Incompatibility," the insertion of new illustrations of autograph prescriptions and numerous new cuts of apparatus, together with descriptions of the same.

There are certain inaccuracies in the book which are of a technical or scientific nature, and while they are not likely to interfere with the usefulness of the book as a working guide, mar it to a certain extent when considered as a work of reference. Under Linum (p. 749) it is stated that the fixed oil is "in the nucleus." While the term "nucleus" was used at one time to designate the kernel of a seed, it is now limited entirely to one of the organized bodies of the cell. The distinction between starch and inulin given on page 744 is not entirely correct. "*Stylidaceæ*" (p. 744) should be "*Stylidiaceæ*," or better, "*Candolleaceæ*." Canna (p. 744), instead of belonging to the *Marantaceæ*, is now classed as a member of the *Cannaceæ*. "*Protococcus vulgaris*" (p. 752) should be "*Pleurococcus vulgaris*." "*Calamintha clinopodium*" (p. 813) should be "*Kœllia incana*." Bael fruit (p. 750) belongs to the *Rutaceæ* and not to *Aurantiaceæ*, as stated. These references are probably sufficient to indicate some of the improvements which might be made in a future edition.

Bacteria in Relation to Plant Diseases. By Erwin F. Smith, in charge of Laboratory of Plant Pathology, Office of Physiology and Pathology, Bureau of Plant Industry, United States Department of Agriculture. Volume I. Methods of work and general literature of bacteriology, exclusive of plant diseases. Washington, D. C.: Published by the Carnegie Institution of Washington, September, 1905.

Dr. Smith ranks as one of the foremost bacteriologists of the day, and he is rendering science a distinct service in giving not only the results of his own researches and experience for the last fifteen years, but also those gained by extensive reading and searching of literature, in the volumes which are to constitute this work, the first

of which we now have the opportunity of reviewing. It is not a text-book that is being written by Dr. Smith, for it has none of the limitations of the text-book. Nor, on the other hand, is it an encyclopedia, for the matter is not abbreviated as in an encyclopedia. It is in fact a reference book of reference books, giving evidence that all of the matter has been thoroughly assimilated, and that scissors and paste have had no part in its construction. It represents the actual thought and experience of one who has long been working in the laboratory and in the fields, and if other writers on this and other subjects would follow his example, we would have fewer and better books, and thus much time would be saved the scientific worker, which is indeed a part of his capital.

The volume before us is divided into two parts:

I. Outline of methods of work. Some two hundred and two pages are given to the presentation of this part, and the subjects discussed include the following: (*a*) The disease; (*b*) the organism in its pathogenesis, morphology and physiology; (*c*) economic aspects; (*d*) general considerations including the location, equipment and care of the laboratory; (*e*) preparation and care of culture media, cleaning and sterilization of glassware and instruments; (*f*) making and transference of pure cultures; (*g*) formulæ for stains, etc., etc.

II. Bibliography and Literature. To this part one hundred and sixty-five pages are devoted, the matter being arranged under fifty-two heads, some of which are indicated as follows: (1) Journals; (2) transactions, Beiträge, Jahresberichte, Festschriften, etc.; (3) manuals; (4) physical, chemical, zoological and botanical works of special use to the plant pathologist; (5) books and papers of more or less general interest; (6) important books and papers on special human and animal diseases; (7) predispositions, conditions favoring infection or immunity; (8) symbiosis and immunity; (9) carriers of infection; (10) general morphology of the bacteria; (11) spores; (12) flagella; (13) capsules; (14) stains and staining methods; (15) morphological and physiological changes due to changed environment; (16) culture media; . . . (21) ptomaines, toxins, antitoxins, serums, phagocytosis; (22) attenuation, virulence; . . . (38) antiseptics and germicides; . . . (46) bacteria in water and ice, dung bacteria, etc., etc.

In connection with the titles of papers Dr. Smith frequently gives

brief abstracts, and in some cases where the original is not readily accessible, he gives an extended abstract. The writer does not know whether Dr. Smith intended to give a complete bibliography of the more authoritative and important works on bacteriology or not, but if he did one wonders why such an important manual as that by Prof. Arthur Meyer, of Marburg, was not included.

This work of Dr. Smith's is probably the most comprehensive that has yet appeared on this subject, and to the writer's mind is the most valuable.

PHARMACEUTICAL MEETINGS OF THE PHILADELPHIA COLLEGE OF PHARMACY.

DECEMBER.

The third stated Pharmaceutical Meeting of the Philadelphia College of Pharmacy for 1905–06 was held on Tuesday afternoon, December 19th, with William McIntyre in the chair.

Prof. Henry Leffmann, the well-known chemist and author, was the speaker of the afternoon, and gave a talk on "The U. S. Pharmacopœia from the Point of View of the Analyst and as a Legal Standard." (See page 77.)

In discussing the address M. I. Wilbert spoke, in part, as follows:

"To pharmacists who are at all interested in advancing the status, as well as the use, of the Pharmacopœia, it must be evident that the very attempt at making the book a comprehensive text-book on the sciences relating to pharmacy, not alone tends to increase the size as well as the price of the Pharmacopœia, but is also the one factor that has evidently delayed the publication of the last edition.

"While we no doubt feel that the Pharmacopœia is, or at least should be, the generally accepted standard for the drugs and remedies that are used in the treatment of disease, we must not forget that of the 140,000 physicians and upwards of 40,000 pharmacists of the country, who should have an intimate knowledge of the contents of the Pharmacopœia, less than 10,000, or about 5 per cent. of the total, were supplied with the book on September 1, 1905, the date when the eighth decennial revision of the Pharmacopœia is supposed to have become official."

Charles H. LaWall spoke of the recurring tests for various salts,

as of chlorides, and said that much space could have been saved by giving these in some one place and referring to them as need be under the chemicals. He expressed the opinion that some of the tests, as, for example, those for esters under essential oils, are too complicated for practical purposes.

W. L. Cliffe remarked upon the subject of the Pharmacopœia as a legal standard, and said that the law governing the adulteration and sophistication of drugs in Pennsylvania is in the hands of the State Board of Pharmacy, and that it is the consensus of opinion of the members of the Board that the Pharmacopœia is the best available standard for their purpose without framing enactments for every article. He said that the law refers to the latest edition of the Pharmacopœia, and, as administered, has never wrought any hardships. He said that in the case of litigation referred to by Dr. Leffmann the question should have been asked as to whether the article in question was sold as a food or medicine, the Board of Pharmacy regarding the Pharmacopœia as a standard for drugs only.

Referring to the subject of doses, Prof. C. B. Lowe said that he considered those of the new Pharmacopœia to be rather low, that they are hardly average doses.

Charles H. LaWall called attention to a sample of Bombay mace which he said had no spice value; and also to some dried pistachio nuts derived from *Pistachia vera* and *P. lentiscus*.

Joseph W. England exhibited a sample of powdered Java cinchona which he obtained from the Powers-Weightman-Rosengarten Company, and which he said contained from 10 to 12 per cent. of alkaloid estimated as quinine sulphate. He said that fully 95 per cent. of the cinchona bark on the market is derived from the cultivated cinchona trees in Java, and that the cinchona market of the world has changed from London to Amsterdam. He said that the system of mossing the bark is not so much in vogue as formerly, the present practice being to cut down the bark-yielding trees and to plant an equivalent number, or more, of selected trees each year. By this method it is possible to increase the content of quinine in the cultivated barks, and it is not unusual for the yield of alkaloid to be equivalent to 12 or 13 per cent. of quinine sulphate. The mossing system was done away with because the increase in quinine was not permanent and because the trees rotted very readily.

JANUARY.

The regular monthly pharmaceutical meeting of the Philadelphia College of Pharmacy was held on Tuesday afternoon, January 16th, with Freeman P. Stroup, president of the Philadelphia College of Pharmacy Alumni Association, in the chair.

The first speaker was Edwin Leigh Newcomb, P.D., Instructor in Botany and Pharmacognosy in the Philadelphia College of Pharmacy, who gave an interesting talk on "A Trip to California, and Some Observations on Pharmacy by the Way," which was illustrated by a large number of specimens of vegetable products, which he presented to the College. This trip included a visit to the Yellowstone National Park and the Lewis and Clarke Exposition. Of the specimens which were exhibited, the following are of pharmaceutical interest: The leaves and fruits of several species of Eucalyptus including *E. globulus*, *E. robusta*, etc., the flowers and fruit of *Olea europæa*, the galls of *Quercus lobata*, roots and leaves and parts of the trunk of the Washingtonian palm (*Washingtonia filamentosa*), the flower stalk of *Agave americana*, the flowers and fruit of pomegranate. The exhibit also included a number of fruits which were shipped by freight in tin fruit-cans and preserved by means of saturated solution of sodium chloride, of which the following may be mentioned: almonds, prunes, plums, lemons, English walnuts. Referring to the condition of pharmacy in the West, the speaker said that he visited a number of drug stores, and that they gave evidence of prosperity, and that the proprietors seemed to be alert to the needs of the profession and to favor progressive measures.

"Compound Solution of Cresol" was the subject of a paper presented by Charles H. LaWall, Ph.M., and E. Fullerton Cook, P.D., of the Pharmaceutical Department of the College. The authors called attention to the fact that the formula for this solution as given in the new Pharmacopœia will not give a satisfactory product unless the solution be allowed to stand for about three weeks in order that complete saponification may take place. To overcome this objection they suggested first making a soap and then adding it to the cresol.

E. M. Boring exhibited a sample of compound solution of cresol, in which saponification had been effected by allowing the mixture to stand five weeks, and keeping it at a temperature in excess of room

temperature. Mr. Boring also exhibited a sample of the official elixir of iron, quinine and strychnine phosphate, which was a yellowish color rather than green, due probably to over-neutralization as suggested by M. I. Wilbert.

M. I. Wilbert said that the fact that the Pharmacopœia requires cresol to answer the test for absence of phenol makes the compound solution of cresol an expensive preparation. In commenting on the formula for this preparation, he said the Committee of Revision might have availed themselves of the more satisfactory formula of the German Pharmacopœia. He said that many of the preparations of this class which produce milky solutions are made from the crude oil from which phenol has been separated, and that the milkiness is due to the presence of naphthalene.

FLORENCE YAPLE,
Secretary pro tem.

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE QUARTERLY MEETING.

The quarterly meeting of the members of the Philadelphia College of Pharmacy was held December 26, 1905, in the Library, at 4 o'clock, the President, Howard B. French, presiding.

Twelve members were present.

The minutes of the Semi-annual Meeting, held September 25th, were read and approved.

The minutes of the Board of Trustees for September 15th, October 2d, and November 8th, were read and approved.

Thomas S. Wiegand called the attention of the members to the analytical balance and the large number of books on the table belonging to the late President Charles Bullock, which were donated to the College by his son, William A. Bullock. In the collection were the "Original Notes on the Investigation of Veratrum Viride." President French, in accepting the gift, said the College was highly honored in obtaining such a valuable accession to its Library from one who had labored long and earnestly for its welfare. Mahlon N. Kline moved that the thanks of the College be tendered to William A. Bullock for the gifts. Unanimously carried.

The President announced the death of two life members: John Bley—elected in 1868; his death occurred at Los Angeles, Cal., August 22, 1905. Buried at South Laurel Hill, October 17th. Allen Shryock—elected in 1870. A paper prepared by Mr. Shryock was read at the Pharmaceutical Meeting in October; his death occurred at Philadelphia, November 14th.

ABSTRACTS FROM MINUTES OF THE BOARD OF TRUSTEES.

September 15, 1905.—Committee on Property reported that the building had been thoroughly cleaned and in good shape for the approaching session. Committee on Library reported a number of accessions to the Library. Committee

on Instruction reported that Professor Lowe had suggested the name of Dr. Alfred Heineberg, a graduate of the College, as his assistant; whereupon he was duly elected. Committee on Examination reported the names of Joseph C. Carlin, Francis C. Handwork, P.D., Charles J. Heinle, Merrill B. Hile, William H. King, John G. Roberts and Frederick W. Steigerwalt, special students in Chemistry, as being entitled to the award of the Certificate of Proficiency in Chemistry, they having successfully passed the prescribed examinations. After consideration, the Board authorized the awarding of certificates. The amendments to the By-Laws, proposed at the meeting in May, relating to entrance examination, were separately acted upon and adopted. C. L. Bonta was elected to active membership.

October 2, 1905.—Committee on Announcement read a financial statement relating to the issuing of the Eighty-fifth Annual Announcement. Professor Moerk reported the receipts and expenditures of the Chemical Laboratory for the year ending August 31, 1905. Class instruction was given to 138 second-year students, 124 third-year students, individual instruction to 86 students and 24 special students received instruction. John J. Finney was elected to active membership.

November 8, 1905.—Committee on Library reported a number of accessions to the Library. Committee on Scholarship reported the names of seven students to whom scholarships were awarded.

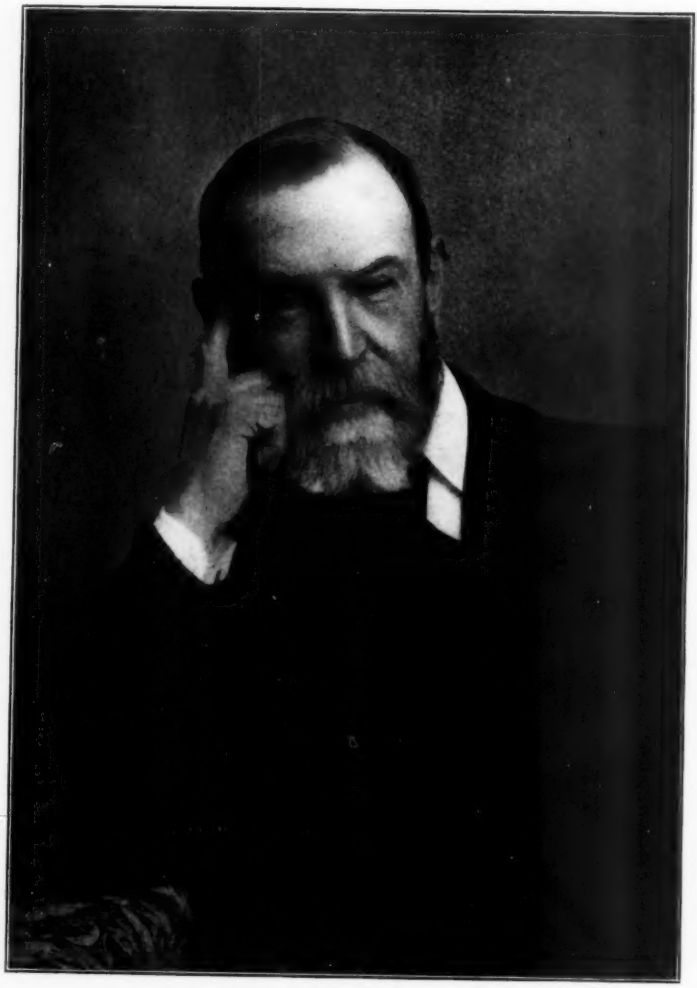
C. A. WEIDEMANN, M.D.,
Recording Secretary.

NOTES AND NEWS.

THE CHEMICAL ENGINEER is a newly established monthly journal of practical, applied and analytical chemistry. The editor is Richard K. Meade, with editorial offices at Nazareth, Pa. A list of special contributors together with the subjects assigned to each is also announced, as follows: W. H. Walker, "Chemical Engineering;" William M. Booth, "Chemical Engineering;" Samuel P. Sadtler, "Industrial Organic Chemistry;" Porter W. Shimer, "Iron and Steel;" Geo. P. Maury, "Iron and Steel;" Robert Job, "Engineering Chemistry;" Robert E. Divine, "Soap and Glycerin;" Edward C. Worden, "Dyes and Textile Chemistry;" William H. Teas, "Leather and Tanning;" L. W. Wilkinson, "Sugar;" William H. Easton, "Electro-chemistry;" Albert H. Welles, "Food and Food Analysis;" Thorne Smith, "Copper;" Albert V. Bleininger, "Ceramics."

THE JOURNAL OF BIOLOGICAL CHEMISTRY has recently made its appearance, with Drs. J. J. Abel, of Baltimore, and C. A. Herter, of New York, as the responsible editors. The pages of this journal are open

(1) To workers in zoology and botany and the branches of knowledge in which these sciences are applied, for such of their researches as are of a chemical or physico-chemical nature. (2) To workers on the chemical side of the experimental medical sciences, as physiology, pathology, pharmacology, hygiene, physiological chemistry and bacteriology. (3) To those who are engaged in any branch of clinical medicine, when their researches are of a chemical nature. (4) To the specialist in organic chemistry, who will find here a fitting place for the publication of researches which have biological or medical interest.



John Attfield